Ergonomics@LLNL

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We are all 'material handlers' when we lift, carry

Don't fall into the trap of thinking of material handling as the province of "big strong folks who pick up heavy boxes all day," says Melanie Alexandre, Hazards Control's ergonomics subject matter expert.

Observes Alexandre: "From an ergonomics perspective, we are all material handlers if we've pushed a lawnmower, pruned a tree, pulled weeds from a garden, lifted a child or grandchild, hoisted boxes during an office move, carried a tool box or building materials, or unloaded groceries from the trunk of a car."

Melanie Alexandre

As we bend, lift, stoop, reach, push, carry, and pull throughout our day, we face an assortment of ergonomic risks, cautions Alexandre.

Overexertion and repetitive motion injuries can occur after prolonged exposure to risk factors associated with material handling, she explains.

More than 300 recordable injuries associated with overexertion occurred at LLNL in 2002–2003. These types of injuries usually affect the back, legs, and arms. Recovery from overexertion and repetitive motion injuries often take more than just a few days of rest.

The effects of these types of injuries do not just limit functioning at work, but can make everyday activities such as sleeping, driving, and eating challenging.

Alexandre says she witnessed the debilitating effects of back injuries and hand injuries before she came to the Laboratory when she worked as an occupational therapist.

"I will never forget the 40-year-old man who was the provider for his family and who could no longer continue to work due to repeated trauma of lifting and carrying while working in a warehouse. He had several back surgeries and had to work very hard to regain his basic functioning including driving, bathing, and getting dressed."

According to Alexandre, we must listen to the signals the body sometimes gives when something is wrong, and we should respond sooner than later to those signals.

"That warehouse worker said to me 'I thought I was young, strong and invincible. I thought I was supposed to hurt because that meant I was working, so I did nothing about the pain for a long time. Little did I know the problems I was creating for my body.' "

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Research lab workers urged to work ergonomically

Just because you work in a research lab, primarily with a microscope, pipettes, or a glove box, don't think that ergonomics—the art and science of melding good habits with an optimal work environment—doesn't apply to you.

"Ergonomics is ergonomics," says physical therapist Beth Yu. "Whether you work in an office or a lab, the same principles apply."

Yu and her colleagues in Health Services and Hazards Control are hoping that message sinks in with research lab workers. They want them to be aware of the need to protect themselves from common ergonomic risk factors the same way office workers do.

These factors include:

Repetition: Doing the same motions over and over again.

Static Posture: Maintaining a posture that is unchanged for extended periods of time.

Force: Applying pressure to or physically exerting any part of the body through a task such as lifting, pushing, pulling, pinching or gripping.

Contact stress: Applying pressure to soft tissue of the body through tools or sharp edges.

Specifically, the Lab's ergonomics specialists want to convince research lab workers not to take discomfort for granted or wait until they start hurting before they seek ergonomic guidance.

Daisy Prado of the Biology and Biotechnology Research Program (BBRP) said that is an important message she heard loud and clear after dealing with Yu.

Prado had been feeling pain when doing pipetting work (stemming, she said, from the repetitive motion of screwing and unscrewing vial caps). She said Yu taught her to "stop what you are doing if you are feeling uncomfortable and don't overexert yourself." Now, Prado says she thinks about ergonomic behavior when she works.

Jessica Wollard demonstrates pipetting, a repetitive research lab task.

The Lab's ergonomics experts say they have noticed that often people are somewhat reluctant to admit to being in discomfort because they don't associate the discomfort with the work they perform. Often, they believe the discomfort may just be a symptom of aging or a result of some activity they performed away from the job.

"Sometimes when people acknowledge discomfort, they attribute it to 'getting older,'" said Yu. "But I have to point out that aging does not always equate with discomfort. Discomfort has a lot to do with bad work habits or improper tools."

Another BBRP employee said it wasn't until a conversation with a member of her directorate's Health and Safety Team and Yu that she realized the numbness and discomfort in her hands at night might be related to her pipetting work.

The employee said she only experienced the discomfort after the fact—when she was at home, not at work—so it was not obvious to her that the discomfort could have been work related. Now, she says, she is familiar with the cause and effect relationship and tries to look closely at how she uses her hands and equipment.

Yu says research lab workers, like their computer-using colleagues, need to follow what are sometimes called the "golden rules of ergonomics":

• Pay attention to how you work — Become aware of your work style and follow good ergonomic practices.

• Take breaks — Breaks help reduce strain. Small 3–5 minute breaks every 30-60 minutes

See **ERGONOMICS** *on Ergonomics@LLNL page 4*

CMS ergonomics walkthrough nears completion

By the end of this fiscal year, a Health Services and Hazards Control duo expects to complete an ergonomics walkthrough of Chemistry and Materials Science (CMS) laboratories.

The CMS walkthrough program began in early 2003, said Health Services' physical therapist Beth Yu, who was assisted by Hazards Control industrial safety engineer and ergo specialist Lois Halunen.

Essentially a comprehensive series of ergonomic evaluations, the walkthrough program was initiated at the request of CMS management as a preventive measure, said Yu, who noted similar walkthroughs were conducted of laboratories in the Biology and Biotechnology Research Program (BBRP).

For CMS, the walkthroughs addressed equipment, body mechanics, and workplace environment issues such as noise level and lighting. The CMS-designated Responsible Individual accompanied the ergo team and demonstrated motions involved in using various pieces of laboratory equipment. Video was shot so the tasks could be studied in more detail later.

"We made many ergonomic suggestions, adjustments and changes during the time we spent in each lab," said Yu.

She noted that most of the specific room-by-room recommendations involved low or no-cost changes. The pair also produced an ergonomic briefing for CMS staff covering good body mechanics, good ergonomic practices and stretching exercises.

The walkthrough program was greeted enthusiastically by CMS employees, said CMS Operations Manager Al Moser, who added, "Since we put this in place, we have had no ergo injuries and our cost index is at an all-time low."

When wearing backpacks, are your kids ergonomically safe?

Are your children carrying too heavy a load—not academic subjects or after school and weekend extracurricular activities, but books and other paraphernalia in the pack on their back?

Chances are your kids may be like others around the world who complain of back pain or discomfort, pain that may be caused by overstuffed and awkwardly worn backpacks they carry to and from school.

Cheryl Bennett

In a brochure titled "The burden of backpacks for children," Lab ergonomics specialist Cheryl Bennett of Hazards Control writes that the relative weight of backpacks youths tote often exceed recommended allowable loads for adult workers. Unfortunately, she says, most parents have never weighed their child's backpack and do not know what it contains.

Copies of the Lab brochure on children's backpacks are available in the Ergonomics Demo Room in Bldg. 255; additional information on ergonomics for children is on the Ergonomics website (http://www.llnl.gov/ergo/life_child.html)

Here are some telltale signs that a backpack is too heavy:

- Red marks caused by backpack straps digging into a child's shoulders.
- Complaints by backpack wearers of numbness or a tingling sensation.
- Difficulty getting a backpack on or off.
- Changes in the natural curves of a child's spine.

The American Academy of Pediatrics cautions that children should never carry more than 10–20 percent of body weight.

Bennett believes an injury potential may exist at the 10-20 percent level because loads of more than 10 percent of body weight can affect respiration, posture and gait. Estimates are that the packs on children's backs often weigh up to 15 percent of body weight.

She offers these backpack safety tips:

Backpacking Do's and Don'ts: Wear a backpack over both shoulders, not slung over just one.

- Empty backpacks weekly and keep them free of items that are not needed.
- Never carry a backpack by one strap. Wear the pack with straps over both shoulders.

The American Physical Therapy Association says that when wheeled packs are chosen as a replacement for the traditional backpack, parents should make certain that the extended handle is long enough so that the child is not forced to twist and bend.

New online video helps with office moves

With move-in drawing closer for new buildings such as the Terascale Simulation Facility, the Computation Directorate has been developing an online ISM training module designed to help people prepare for office moves safely.

A collaboration by Computation, Hazards Control and Health Services, the 8-10 minute multimedia presentation outlines some simple ways employees can protect themselves from injuries while packing up and moving to new quarters.

Computation's Marlene Sandberg, an ergonomics specialist, says one of the biggest sources of injury to directorate workers stems from lifting monitors and setting up workstations.

"That statistic got us to require our technicians to take the back injury prevention class the Laboratory offers, " said Sandberg. "Then we thought we needed to go one step beyond and provide specific training for all employees who may be involved in an office move."

The multimedia presentation features Bill Wells of Hazards Control offering general office move tips. The Computation Directorate, said Sandberg, wants to make the presentation available to all employees, perhaps via a link on the Ergonomics Program's Website (www.llnl.gov/ergo).

A companion to the presentation is a one-page Tips on Office Moves that references related classes (OH8003, Preventing Back Injuries During Office Moves and OH8002, Back Injury Prevention) and discusses planning the move, securing the right materials, using good body mechanics, and packing effectively.

Here are the tips you can use for your next office move:

Plan the Move

- Schedule enough time to pack over several days; avoid long packing sessions.
- Get adequate rest; fatigue induces injury.
- Identify items others will handle.
- Plan to keep pathways open.

Get Needed Materials

- Order boxes that are right sized (small for heavy items).
- Obtain a step stool for items on shelves.
- Get a cart, if necessary, to position and move boxes.
- Stage a recycling box for discarded paper.

Use Good Body Mechanics

- Use appropriate lifting and bending techniques; for example lift with your knees, not with your back, and turn your feet to prevent twisting your body.
- Use proper carrying techniques: for example, test the item first for reasonable weight and hold the item close and waist high. Make certain your view is not obstructed.
- Use proper packing techniques; when reaching down, bend at hips and use a step stool to reach items above shoulder height.

Pack effectively

- Pack only what you need; spring clean.
- Leave frequently used items for last.
- Label your boxes—for content and destination.
- Mark boxes to indicate items you need immediately after the move.
- Don't try to do it all. Let movers handle those items they are scheduled to move.
- Don't clutter pathways; keep them clear.
- Pack from top down and unpack from bottom up to keep cabinets stabilized.
- Don't lift heavy items by yourself; use a cart or dolly, or seek help from co-workers.
- Leave boxes partially full if they would be too heavy completely filled.
- Place packed boxes in location that minimizes bending and twisting.
- Regulate packing and unpacking; take breaks, spread it over several days.

Get Ergonomics Help

If you are experiencing discomfort, notify your supervisor, contact your ES&H Team member or Health Services by calling **2-ERGO**.

For ergonomic tips and information on the wide array of ergonomic services available at the Laboratory, visit the Ergonomics Web-site at **http://www.llnl.gov/ergo**

For ergonomic evaluations, contact your supervisor, your ES&H Team member, or your department's ergo evaluators. For help, call **2-ERGO**.

Increase your Ergonomics awareness

Sept. 22: "Hand Tools and Ergonomics,"
Melanie Alexandre, ergonomics subject matter expert

Learn how to select hand tools for work or home. This talk spans power and non-power tools to gardening instruments and tweezers.

Sept. 29: "Lifting for Parents and Children,"
Cheryl Bennett, ergonomics specialist

Demonstrations of safe lifting when diapering, bathing or playing with your children or lifting them from car seats, strollers, and cribs. Learn how to pass lifting and carrying tips on to children, especially those who struggle with heavy backpacks.

Talks held
in the Bldg. 361 auditorium
Time: 11:30 a.m.

Balan encourages employees to watch their backs

Physical therapist Ronnie Balan of Health Services could be called the "guru of back injury prevention," if the Lab had such a position. When it comes to keeping you safe on the job, she "watches your back" and wants you to pay attention to it as well.

Balan, who has worked at hospitals in the Boston area, Concord (Calif.), and Castro Valley, joined the Laboratory in 1996. She holds an undergraduate degree in physical therapy from Northeastern University and a Masters in health education from San Francisco State University.

Ronnie Balan teaches techniques to prevent back injuries when lifting.

At the Laboratory, Balan teaches a series of classes on site on the prevention of back and upper extremity injuries. She also provides physical therapy to employees with work-related injuries upon referrals from Lab physicians and nurse practitioners, and, through the Ergonomics Intervention Program (EIP), provides field visits to prevent injuries.

EIP provides services for workers in the first/early stages of discomfort (work- or non-work related) and is designed to support workers at their work site, regardless of whether it is an office or non-office environment. (For questions or referrals, call 2-ERGO.)

According to Balan and other specialists involved with the Laboratory's ergonomics program, our back works during every activity, including sitting, standing, lifting, bending and sleeping.

An estimated 75 percent of adults, however, have or will experience back pain in their lifetime. Injuries to the back, moreover, are often not quick to heal because joints, muscles, and nerves can be impacted.

After spending 20 years in hospital settings working with "patients who suffered painful injuries to their backs," Balan said, she decided to focus on injury prevention.

"Often patients would say to me, 'No one taught me that,'" says Balan. "My response was, 'When we were 22 years old we weren't receptive, but now that we're older and hurting, we have a bit more motivation to improve the way we do our work.' People, however, should not wait until they hurt to learn to use their body properly to avoid injury."

The opportunity to do patient care and injury prevention led Balan to the Laboratory. "If somebody is injured, I can go out to his or her work space and see what kinds of things may have precipitated that injury, and work on teaching safe movement and job practices to prevent a recurrence," she says. "And through EIP, I work with employees at their work sites to educate them on ergonomics to prevent discomfort from turning into injury."

One of the valuable ways Balan passes along back injury prevention tips is through Health Services' Back Care Workshop (HS5330), designed primarily for employees assigned to continuous high-intensity repetitive tasks that could affect the back. Even employees who lift or carry material occasionally can benefit from the course, Balan says.

"I do some basic anatomy first, and then I focus on how people move, how they should lift, push, pull, and carry—what I call functional body mechanics," she says. "Most people do those things intuitively, and they may or may not be doing them the best way the body was designed to perform those tasks."

Balan stresses the value of physical conditioning to keep the back strong. "If you are not in good condition, you are at higher risk," she says. "A lot of people who have injured their backs do the exercises we recommend until they start feeling better, and then they slack off, and they have a recurrent injury. You really need to maintain your conditioning."

Health Services offers a class on Preventing Back Injuries During Offices Moves (OH8003). Another valuable resource is a Healthy Backs assessment course (OH1003) conducted by Phil Arzino of Health Services.

Offered by appointment every Thursday in Health Services' Physical Therapy Center (call 2-7462 for an appointment), the assessment focuses on indicators of trunk strength and flexibility, with reference to back health and care.

Balan emphasizes that the Livermore Laboratory Employee Services Association has a lot of good programs on site to help employees stay in shape.

"I am not a sports medicine specialist, but I do take a sports medicine approach," Balan says. "I think it is important to pay attention to the whole body, keep it fit and use it properly."

Balan offers these tips for preventing injury to your back:

- Think before you do. Mentally plan and practice your task.
- Maintain your natural spinal curves. Maintain neutral posture when you are sitting, standing, lifting, pushing or pulling.
- Bend your knees. Lift with your legs, squat with your back in neutral position.
- Pivot, don't twist: Turn your feet rather than twist your body.
- Carry it right: Keep the load close to your body.
- Keep in shape: Do some regular cardiovascular exercises and strengthen the abdominal and leg muscles.

People working with microscopes need to learn to ergonomically optimize their lab set-up.

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will help.

• Vary your tasks — Don't perform the same activity for a long period of time. Divide large projects into 30-60 minute blocks of time.

• Stretch regularly — Stretches, like breaks, help reduce stress. Stretch your neck, shoulders, back, arms and wrists.

Here are some observations and recommendations for employees who perform microscopy or who work with pipettes or glove boxes.

Microscopy

Working with microscopes is a vision-intense activity that can lead to eyestrain. Traditionally, microscopy involves static and forward head postures and using repetitive hand motions and pinch-grip forces to make fine adjustments to controls or to handle a specimen. Soft tissues can be damaged and circulation restricted from contact stress as workers lean their arms on their workbenches.

Those who work with microscopes should try to incorporate some of the tips below to make sure their microscopy setup has been optimized for their body:

• Make frequent postural changes, plan breaks, and use a cueing device such as a timer, watch, or pager.

• Position the microscope as close to you as possible, with the eyepiece at eye level. Remove clutter, cabinet doors, etc., so you can get closer to the microscope and have it directly in front of you.

• Be gentle on your eyes. Blink often. To relax the eye muscles, focus every 20 minutes on an object 20 feet away. Try to use a television or computer screen for viewing.

• Protect your forearms and elbows by padding the work surface edge and area where they will be resting.

• When manipulating controls, alternate between use of your right and left hands. When possible, when purchasing new equipment, look for the ability to use both hands for the same function.

Glove boxes

Working with a glove box, says Yu, presents its own set of ergonomic challenges: contact stress issues exist due to the metal glove box portholes and to the fact that people have a tendency to rest their arms on those sharp and hard surfaces. Then there are problems with the gloves themselves: they are very stiff, come in different thicknesses and sizes. A person with small hands, for instance, may have to work in a unit that has large gloves or vice versa. Then there is the problem of awkward posture as someone leans into the unit to manipulate an object.

Here are some tips to improve your comfort and safety when using glove boxes:

• Respect your body and make frequent postural or task changes.

• Place items within range of a comfortable reach. Items being accessed during an experiment should be no farther away than fingertip length.

• Use anti-fatigue mats for tasks that require you to stand. Use a footrest to alternately elevate a foot to take pressure off the low-back area.

• Adjust your chair for proper height and use footrests or stools.

• Use padding on edges of sharp surfaces.

• Alternate hands and tools.

• Avoid continuous tight grasp of an object and awkward postures in the neck, back and shoulders.

Pipetting

Pipetting can be a highly repetitive task. It is also one that can entail forceful exertion of the fingers and thumb and awkward positioning of fingers, arm and shoulder. Here are some tips to make pipetting more comfortable.

• Use a pipette with a low force trigger or triggers, that allow triggers to be activated by more than one finger, that is optimized for your hand size, and that will minimize repetition.

• Organize your supplies to eliminate excessive reaching, twisting and bending.

• Alternate hands or use both hands.

Think about modifying non-ergonomic tools

Simple, inexpensive modifications to common tools found in research labs such as tweezers, scrapers and small screwdrivers can help eliminate awkward wrist postures and pinch-grip fatigue injuries, says physical therapist Beth Yu.

Yu and her associates have been working with clients in the Biology and Biotechnology Research Program (BBRP) and the Chemistry and Materials Science (CMS) Directorate to make tool modifications.

One of the more troublesome tools is tweezers. "The tool is OK if you just have to use it for a few seconds, but can cause a serious thumb problem if you have to apply pressure for a long time to hold very, very small items," said Yu. "Building up that tool helps save thumbs."

Modifications are designed to

• Make the tool better fit the user's hand,

• Change the angle of the tool's handle so awkward wrist posture can be eliminated, or

• Reduce the force needed to manipulate the tool.

"When we do an ergonomic evaluation we may see a tool that needs modification," says Yu. "I'll ask for a spare, and my clients will send it to me. I build it up and send it back and they give me feedback.

"If they like what has been done, they can let me do the rest of the tools, or I give them the material (thermoplastic pellets) to make the modification and show them how to do it."

Questions on tool modifications can be directed to Yu at 2-4301; Melanie Alexandre, Hazards Control's ergonomics subject matter expert, at 2-8237; or 2-ERGO, the Laboratory's ergonomics hotline.

HANDLING continued

According to the Bureau of Labor Statistics, most back injuries are not acute one-time accidents; they are mainly caused by repetitive motion injuries. However, sometimes one incident can cause a body to surrender to repetitive stresses.

Alexandre offers the situation of a woman who was injured trying to replace the water bottle on top of an office cooler. "The water bottle started to fall and she tried to catch it," she said, recalling the office worker incident. "The woman was in a twisted position and ended up injuring her low back and neck. Chances are it was not just that one incident that caused the injury. Perhaps her body was exposed to 'little stressors' from various material handling and repetitive motions, but this time her body said 'I quit. I cannot handle this anymore.'"

Since joining the Laboratory in 2002, Alexandre has been aggressively trying to get employees to realize that ergonomic safety is an issue that all workers should consider.

The message that "ergonomics is for all employees" may be taking hold, as evidenced by a remark a Plant Engineering crafts worker made to Alexandre recently.

Alexandre had been working with Plant Engineering employees as part of an effort to provide ergonomic hand tools, when a PE employee told her that he used to think that only people who work in an office have to be concerned about ergonomics. "I did not think ergonomics applied to me," the employee said. "Now I see that it does."

When moving large, heavy or awkward objects, get help to perform the task safely.

Adds Alexandre, "My hope is that people who read this article—whether they view themselves as a professional material handler or an 'amateur'— make themselves aware of risk factors and establish a plan to use their body in the best ways possible to maintain their current quality of life."

Employees, says Alexandre, should ask themselves the following questions regardless of task to ensure they are considering ergonomics principles while doing "material handling":

• Is there a better way to move this item that will decrease the stress to my body?

• Is there a piece of equipment that will help me lift or carry this item safely?

• Is the item stored in the best location to prevent me from doing excessive reaching or bending?

• Should I ask for assistance?

Alexandre encourages individuals wanting additional help on ergonomics and materials handling to visit a Lab Web site (http://www.llnl.gov/ergo/mh_ergo.html) that contains helpful tips, links, training and resources.

A call to 2-ERGO, the Laboratory's ergonomics hotline, also can help provide access to services and resources for getting a handle on material handling.